Highlights

Demographics

♦ **The size of the college-age population has decreased in all major industrialized countries although within different time frames.** The U.S. college-age population decreased from 22 million in 1980 to 17.5 million in 1997, a reduction of 23 percent. Europe's college-age population has begun a steeper decline, from 30 million in 1985 to 22 million in 2005, a reduction of 27 percent. Japan's college-age population of 10 million, which began to decline in 1995, is projected to reach a low of 7 million in 2015, representing a loss of 30 percent.

♦ **In the United States, the nearly 20-year population decline in the size of the college-age cohort reversed in 1997 and is projected to increase from 17.5 million to 21.2 million by 2010, with strong growth among minority groups.** This increase in the college-age population by more than 13 percent in the first decade of the 21st century signals another wave of expansion in the nation's higher education system and growth in science and engineering (S&E) degrees at all levels.

♦ **Demographic trends show an increase in the minority population in the United States.** The traditional college-age population of white students will expand slowly until 2010 and then decline, whereas the traditional college-age population of racial and ethnic minorities will continue to rise. These trends offer a challenge to the United States to educate students who have been traditionally underrepresented in S&E.

Characteristics of Higher Education by Type of Institution

♦ **Overall enrollment in the nation's institutions of higher education increased from 7 million in 1967 to 15 million in 1992 and then continued essentially unchanged through 1997.** Enrollment in higher education is expected to increase in the first decade of the 21st century because of a predicted 13 percent increase in the population of the college-age cohort during this period.

♦ **Research universities enroll only 19 percent of the students in higher education, but they play the largest role in S&E degree production.** They produce most of the engineering degrees and a large proportion of natural and social science degrees at both the graduate and undergraduate levels. In 1998, the nation's 127 research universities awarded more than 42 percent of all S&E bachelor's degrees and 52 percent of all S&E master's degrees.

♦ **By 1997, enrollment in community colleges was 38 percent of the total enrollment in higher education.** Community colleges serve a diverse population of students and have a broad set of missions. They confer associate degrees, serve as a bridge for students to attend four-year colleges, and expand the supply of information technology workers through certificate programs. They offer a wide array of remedial courses and services and enroll millions of students in noncredit and workforce training classes.

♦ **Traditional institutions of higher education are augmented by industrial learning centers, distance education, and certificate programs.** Substantial education within industry is at the level of higher education and oriented toward engineering, design, and business management. Interest in taking S&E courses and entire programs via distance education is growing. In 1997, more than 50,000 different on-line courses were offered by postsecondary institutions, and 91 percent of those were college-level credit courses.

Undergraduate S&E Students and Degrees in the United States

♦ **A key challenge for undergraduate education is preparing K–12 teachers in science and mathematics.** In the upcoming decade, the nation's school districts will need to hire 2.2 million new teachers, including 240,000 middle and high school mathematics and science teachers. Of the total, 70 percent will be new to the profession because of older teachers retiring and the increase in student population.

♦ **The percentage of high school graduates enrolling in college is increasing for some racial groups.** By 1999, approximately 45 percent of white and 39 percent of black high school graduates were enrolled in college, up from approximately 31 and 29 percent, respectively, in 1979. In contrast, during this period, enrollment rates in higher education for Hispanic high school graduates increased only slightly, from 30 to 32 percent.

♦ **In the past two decades, the proportion of white students in the nation's undergraduate student enrollment decreased, falling from 80 percent in 1978 to 70 percent in 1997.** The proportion of underrepresented minorities increased the most, from 15.7 to 21.7 percent; Asians/Pacific Islanders increased from 2.0 to 5.8 percent, and foreign students remained at approximately 2 percent of undergraduate enrollment.

♦ **Women outnumber men in undergraduate enrollment for every race and ethnic group.** White women constitute 55 percent of white undergraduate students, and black women constitute 62 percent of black undergraduate enrollment.

♦ **The long-term trend has been for fewer students to enroll in engineering.** Undergraduate engineering enrollment declined by more than 20 percent, from 441,000 students in 1983 (the peak year) to 361,000 students in 1999. Graduate engineering enrollment peaked in 1993 and continues to decline.

- **Approximately 25–30 percent of students entering college in the United States intend to major in S&E fields, but a considerable gap exists between freshman intentions and successful completion of S&E degrees.** Fewer than 50 percent of those who intend to major in S&E fields complete an S&E degree within five years. Underrepresented minorities drop out of S&E programs at a higher rate than other groups.
- **For the past several decades, about one-third of bachelor's degrees have been awarded in S&E fields, but from 1986 to 1998, the percentage of engineering degrees decreased from 8 to 5 percent of total undergraduate degrees.** Since 1986, the percentage of bachelor's degrees earned by undergraduates also has declined slightly in physical sciences, mathematics, and computer sciences. In contrast, since 1986, students have earned a higher percentage of bachelor's degrees in social and behavioral sciences and in biological sciences.
- **The ratio of natural science and engineering (NS&E) degrees to the population of 24-year-olds in the United States has been between 4 and 5 per 100 for the past several decades and reached 6 per 100 in 1998.** Several Asian and European countries, however, have higher participation rates, and the U.S. gap in educational attainment between whites and racial/ethnic minorities continues to be wide; the rate of earning NS&E degrees for racial/ethnic minorities is still less than half the rate of the total population.

Graduate S&E Students and Degrees in the United States

- **Long-term trends show that the proportion of women enrolled in all graduate S&E fields is increasing.** By 1999, women constituted 59 percent of the graduate enrollment in social and behavioral sciences, 43 percent of the graduate enrollment in natural sciences, and 20 percent of the graduate enrollment in engineering. Women in underrepresented minority groups have a higher proportion of graduate enrollment than women in other groups; one-third of black graduate students in engineering and more than one-half of the black graduate students in natural sciences are women.
- **Long-term trends show that the enrollment of foreign graduate students in S&E fields in the United States is increasing.** This increase, coupled with a declining number of American white (majority) students, resulted in an approximately equal number of American white and foreign students in U.S. graduate programs in mathematics, computer sciences, and engineering in 1999.
- **After a steady upward trend during the past two decades, the overall number of earned doctoral degrees in S&E fields declined in 1999.** Trends differ by field. Degrees in biological sciences followed the overall pattern and declined for the first time in 1999. Strong increases in the number of degrees earned in engineering peaked in 1996 and were followed by three years of decline. This decrease in the number of engineering degrees earned is accounted for mainly by the decrease in the number of degrees earned by foreign students from 1996 to 1999.
- **At the doctoral level, the proportion of S&E degrees earned by women has risen considerably in the past three decades, reaching a record 43 percent in 1999.** However, dramatic differences by field exist. In 1999, women earned 42 percent of doctoral degrees in the social sciences; 41 percent of those in biological and agricultural sciences; 23 percent of those in physical sciences; 18 percent of those in computer sciences; and 15 percent of those in engineering.
- **Each year from 1986 to 1996, the number of foreign students earning S&E doctoral degrees from universities in the United States increased; it declined every year thereafter.** During the period 1986–99, foreign students earned 120,000 doctoral degrees in S&E fields. China was the top country of origin of these foreign students; almost 24,000 Chinese earned S&E doctoral degrees at universities in the United States during this period.
- **The National Institutes of Health (NIH) and the National Science Foundation support most of the S&E graduate students whose primary support comes from the Federal Government, 17,000 and 14,000 students, respectively.** The proportion of students supported primarily by NIH increased from less than 22 percent in 1980 to 29 percent in 1999; those supported primarily by NSF increased from less than 18 percent in 1980 to 21 percent in 1999. In contrast, the Department of Defense provided primary support for a declining proportion of students funded primarily by Federal sources, 17 percent in 1988 and 12 percent in 1999.
- **By 1999, more than 72 percent of foreign students who earned S&E doctoral degrees at universities in the United States reported that they planned to stay in the United States after graduation, and 50 percent accepted firm offers to do so.** These percentages in the late 1990s represent significant increases. Historically, approximately 50 percent of foreign doctoral recipients planned to stay in the United States after graduation, and a smaller proportion had firm offers to do so.
- **Although the number of foreign doctoral recipients planning to stay in the United States increased in the 1990s, opportunities are expanding for returning to their home countries or for collaborative research and networking with home-country scientists.** Taiwan and South Korea have been the most able to absorb Ph.D.-holding scientists and engineers trained abroad. Some of this recruitment occurs after a distinguished science career abroad.

Increasing Global Capacity in S&E

- **In 1999, more than 2.6 million students worldwide earned a bachelor's degree in science or engineering.** More than 1.1 million of the 2.6 million S&E degrees were earned by Asian students at Asian universities. Students across Europe (including Eastern Europe and Russia) earned almost 800,000 first university degrees in S&E fields. Students in North America earned more than 600,000 S&E bachelor's degrees.
- **Trend data for bachelor's degrees show that the number of degrees earned in the United States remained stable or declined in the 1990s in all fields except psychology and biology.** In contrast, trend data available for selected Asian countries show strong growth in degree production in all S&E fields. At the bachelor's level, institutions of higher education in Asian countries produce approximately six times as many engineering degrees as do institutions in the United States.
- **Although the United States has traditionally been a world leader in providing broad access to higher education, other countries have expanded their higher education systems, and the United States is now 1 of 10 countries providing a college education to approximately one-third or more of their college-age population.** The ratio of natural science and engineering (NS&E) degrees to the college-age population is higher than in the United States in more than 16 other countries.
- **Among some Asian countries, women earn first university degrees at a rate similar to or higher than the corresponding rate in many European countries.** However, only in South Korea do women have high participation rates in NS&E degree programs. In 1998, the ratio of women-earned degrees in these fields to the female population of 24-year-olds was 4.6 per 100, higher than the participation rate of women in other Asian countries, Germany, or the United States.
- **The group of traditional host countries for many foreign students (United States, France, and United Kingdom) is expanding to include Japan, Germany, and Australia, and the proportion of foreign graduate students is increasing in these countries.** Foreign S&E graduate student enrollment in the United Kingdom increased from 28.9 percent in 1995 to 31.5 percent in 1999. Percentages differ by field; foreign student graduate enrollment in U.K. universities reached 37.6 percent in engineering and 40 percent in social and behavioral sciences.
- **Developing Asian countries, starting from a very low base in the 1970s and 1980s, have increased their S&E doctoral production by several orders of magnitude. China now produces the most S&E doctoral degrees in Asia and ranks fifth in the world.** Within Europe, France, Germany, and the United Kingdom have almost doubled their S&E doctoral degree production in the past two decades, with slight declines in 1998.
- **Because of the growing capacity of some developing Asian countries and economies (China, South Korea, and Taiwan) to provide advanced S&E education, the proportion of doctoral degrees earned by their citizens in the United States has decreased.** In the past five years, Chinese and South Korean students earned more S&E doctoral degrees in their respective countries than in the United States; in 1999, Taiwanese students for the first time earned more S&E doctoral degrees at Taiwanese universities than at U.S. universities.
- **In 1999, Europe produced far more S&E doctoral degrees (54,000) than the United States (26,000) or Asia (21,000).** Considering broad fields of science, most of the doctorates earned in natural sciences, social sciences, and engineering are earned at European universities. The United States awards more doctoral degrees in natural and social sciences than Asian countries.
- **Like the United States, the United Kingdom and France have a large percentage of foreign students in their S&E doctoral programs.** In 1999, foreign students earned 44 percent of the doctoral engineering degrees awarded by U.K. universities, 30 percent of those awarded by French universities, and 49 percent of those awarded by universities in the United States. In that same year, foreign students earned more than 31 percent of the doctoral degrees awarded in computer sciences in France, 38 percent of those awarded in the United Kingdom, and 47 percent of those awarded in the United States.